

Western's monthly energy efficiency and renewable energy newsletter dedicated to customer activities and sharing information on energy services.

## Record attendance heats up 2009 geothermal conference

It was a sign of the times—and of growing interest in all forms of renewable energy—when more than 2,000 people gathered in Reno, Nev., to discuss the technology, policy, development and challenges of geothermal energy.

The Geothermal Resource Council (GRC) hosted its 33rd annual meeting, Making Renewable Energy Hot, at the Peppermill Resort and Casino Oct. 4 through 7. “Attendance at this year’s annual meeting is up by 23 percent over last year, and by more than 400 percent since 2003,” said GRC Executive Director Curt Robinson. “It seems that utilities and power producers are finally recognizing that geothermal energy’s base-load capacity provides an important component of their energy portfolio.”

Conference General Chair Randy Manion, manager of Western’s Renewable Energy Program, agreed. “It’s encouraging to see the power industry giving geothermal energy



**Geothermal professional take in the Geothermal Energy Association trade show, the companion event to the GRC annual meeting. (Photo by Geothermal Resource Council)**

the attention it deserves,” he said. “More than 400 cities and counties across the United States can immediately benefit from low-temperature geothermal technologies; and practically every city and state in the country can benefit from ground-source heat pumps.

Praising the meeting planning committee for raising the bar of success this year, Manion added that he looked forward to assisting the 2010 committee in planning another record-breaking meeting.

### Opening strong

Many attendees arrived early to take field trips to nearby geothermal

powerplants or to play in the first GRC Charity Golf Tournament which raised \$1,400 for the Children’s Miracle Network of Reno. The event kicked into high gear with the opening session Monday morning. City Councilman David Aiazzi read a proclamation from Reno Mayor Bob Cashell declaring Oct. 5, 2009, Geothermal Day. “Nevada is the Gulf of Mexico of geothermal energy,” Aiazzi told the crowd, “and Reno is Houston, 1920.”

Dr. Subir Sanyal, president of GeothermEx and speaker chairman for the meeting, followed Aiazzi

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# Conference

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with a welcome message from Sen. Harry Reid and acted as emcee for the session. The roster of international speakers came from government, business and industry associations to discuss topics ranging from scientific to practical to political.

Those who were new to the industry quickly realized that while geothermal energy shares many challenges with other renewables, some issues are unique to this resource.

## Private side

Lucien Bronicki, CEO of Ormat Technologies, and Richard Clayton, CEO of Raser Technologies, covered some of those issues from the corporate side. Bronicki spoke of the need for better exploration strategies, lower drilling costs and improved technologies for producing power from low-temperature resources.

While geothermal projects are subject to many of the same financing challenges as other renewables,

Clayton noted that the resource's base-load status improves its attraction for investors. He pointed to a New York University study that found geothermal to be the fastest improving renewable energy technology. "With investment in research and development, it could be cheaper than fossil fuels," he said.

## Public concerns

Bureau of Land Management (BLM) Director Robert Abbey observed that a complex permitting process—four stages requiring separate permissions—makes development difficult. The BLM is currently reviewing applications for projects totaling 1,300 MW.

The assessment of the underground resource has a lot more in common with mining than wind, solar or biomass, which adds layers of environmental safeguards. This will pose a serious challenge, Abbey acknowledged, to developing the potential 9,000 MW of geothermal power on public land in Western states. "It will be necessary to exploit those resources to reach the goal of 25 percent renewable energy by 2025."

The Recovery Act is helping private development move forward, however, said DOE Deputy Assistant Secretary Jacques Beaudry-Losique. The Office of Energy Efficiency and Renewable Energy (EERE) is reviewing applications for \$32 million in ARRA funding for geothermal projects by small businesses. The announcement for the first phase of awards will come in November.

## Marketing power, image

Brian Brady, general manager of Western customer Imperial Irrigation District (IID), talked about the many interests the utility is juggling in an effort to develop more of the Imperial Valley's geothermal resources. IID already receives 600 MW from the Salton Sea powerplant, and estimates that another 200,000 MW could be tapped. The largely agricultural utility is building a new 230-kV line right through the center of the resource, and is about to finalize the sale of land for project development.

On one hand, Brady noted, Imperial County, which ranks at the bottom of economic indicators in California, is enthusiastic about the potential economic development. On the other, IID faces "water anxiety"—many types of geothermal powerplants require significant amounts of water for cooling. Agriculture uses 90 percent of the 3 million acre/feet under the irrigation district's control. "That is going to have to shift, but industry must employ the most advanced technologies and best practices to prove best use of water resources," he said.

Overcoming valid community concerns and "not-in-my-backyard" opposition cannot be done with technology and best practices alone, said Alison Thompson, executive director of the Canadian Geothermal Energy Association (CanGEA). Thompson admitted that she was jealous of the wind industry's success with telling its story to the public. Canada has a goal of installing 5,000 MW of

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# Conference

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geothermal power by 2015. For that to happen, she said, the industry needs to step up its marketing game, educate government and build relationships with consumers. During her remarks to the opening session, Thompson showed a video CanGEA produced (at the bottom of the CanGEA home page) promoting geothermal energy to consumers.

## Utilities acquire geothermal

IID is just one of the Western customers that showed up at the conference to talk about actively pursuing geothermal power. Sacramento Municipal Utility District (SMUD) and Navopache Electric Cooperative in Arizona both gave presentations as part of the utility track sessions.

Elaine Sison-Lebrilla, senior project manager for SMUD's Advanced, Renewable and Distributed Generation Program, talked about how geothermal power fits into the utility's goal of 37 percent renewable energy by 2020. Geothermal represents 21 percent of SMUD's renewable portfolio, ranking behind wind and biomass holdings. Sison-Lebrilla pointed to the usual suspects—transmission, high production costs, permitting and financing—as barriers to increasing geothermal generation. The municipal utility is studying the option of developing green resources within its balancing area, which includes only a small amount of geothermal resource.

Navopache Electric, which explored geothermal generation as far back as 1982, is now moving forward on building Arizona's first geothermal facility, CEO Dennis Hughes said in his presentation. The state renewable energy standard of 15 percent by 2025, passed in 2006, helped revive the project. Enhanced geothermal system (EGS) technology will make it possible to generate power from the 174-degree well, and the resource's location on private land served by an existing transmission line makes development feasible for the co-op. "The plant won't even be visible from the closest road," Hughes noted proudly.

The proposed 5-MW project will cost \$25 million and is expected to be online in three years. The EGS plant will produce cheaper power than a similar-sized photovoltaic installation, said Hughes.

## Direct use

The conference agenda did not neglect perhaps the greatest opportunity for utilities in geothermal development—direct-use applications.

The town of Akutan, Alaska, in the Aleutian Islands, is evaluating plans to harness nearby geothermal resources to reduce total reliance on diesel generators and provide economic development. The combined heat-and-power system envisioned by town officials could not only power the fish processing plants, but also warm homes, businesses and greenhouses, and create a spa to attract tourists.

Towns and utilities don't need nearby generation-quality resources to reap the benefits of geothermal energy. Entire session tracks were dedicated to ground-source heat pumps (GSHP), a form of direct use that is available virtually anywhere.

In spite of that flexibility, U.S. contractors install only half the GSHP systems annually that their European counterparts do. This is partly because Europe's government-controlled utilities can more easily set up programs that offset the high first cost of installation to the customer. Only cooperatives in the United States offer similar programs, such as Delta-Montrose Energy Association's (DMEA) ground loop tariff and Plumas-Sierra Rural Electric Cooperative's loop lease. Paul Bony, formerly of DMEA, said such programs provide the utility with a steady source of revenue, better load management and loyal customers.

While many utilities have not yet recognized the benefits of GSHP systems, John Kelly of the Geothermal Heat Pump Consortium saw positive developments in the market. When consumers see incentives for a technology like the rebates offered in the Recovery Act, it increases their confidence in the system. More confidence would lead to more installations which would encourage greater infrastructure for installation. He added, however, that the industry needs to do more training and quality control to ensure that the systems deliver on their promise—both to customers and power providers. ⚡

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# Report points communities toward geothermal development

**L**ong before the current “locavore” movement began spotlighting the many benefits of supporting local business, municipal utilities and electric cooperatives understood the importance of keeping the communities they serve economically healthy. So, public power providers may be surprised to discover an overlooked economic development opportunity right in their own backyards: geothermal resources.

The Oregon Institute of Technology’s (OIT) Geo-Heat Center recently updated its report, *Communities with Geothermal Development Potential*, to encourage communities located near geothermal resources to take advantage of them. And a significant number of towns could be doing that—the report identified 404 communities in 16 western states.

These “collocated” communities are within five miles of wells and springs with a temperature of 122°F (50°C) or more. Co-ops and communities may not realize that such low-to moderate-temperature resources could potentially generate power, said OIT Assistant Director Tonya Boyd, who compiled the data. “That was one reason for updating the report,” she acknowledged. “Geothermal generator technology has come a long way—20 years ago, a resource of less than 300°F wasn’t enough to generate power.”

So an exploration well that was deemed not worth developing in the 1980s could, depending on other factors, become a local, renewable powerplant.

## More than electricity

Even if power generation is not an option, Boyd noted, the community can still benefit from developing direct-use applications. The report classifies resource temperatures by possible uses:

- 122°F – Resort/spa facilities and greenhouse and aquaculture operations
- 145°F and above – Space and district heating
- 180°F and above – Industrial applications
- 200°F and above – Power generation

All of the 404 communities have a potential for resort/spa facilities and greenhouse and aquaculture applications. Of those, 204 could harness earth’s energy for space and district heating, 91 additional communities have resources that could support industrial applications and 58 have the potential for electric power generation.

Many of these towns are in parts of the west that greatly need the jobs and revenue such projects could create. So, while power production might not be an option, local utilities still have reasons to take an active interest in development. Space and district heating systems, for example, might smooth out winter peaks created by electric resistance heaters.



**A report from Oregon Institute of Technology (OIT) lists communities that may be able harness lower-temperature geothermal resources to build local powerplants like the one workshop attendees toured on OIT’s Klamath campus. (Photo by OIT Geo-Heat Center)**

Replacing wood and propane systems with clean, reliable geothermal heat could potentially improve the economic, and some cases, the physical health of a community. And a clean, carbon-free source of industrial process heat is only going to become more attractive to businesses.

## Cost-effective resource

The uses for low- to moderate-temperature resources are as varied as the communities themselves. Breweries, fish farms, food processing facilities, biofuel plants, even college campuses throughout the west use geothermal energy to keep operation costs down. For decades, the Klamath Falls campus of OIT has tapped heat from the earth to warm classrooms, heat its swimming pool and melt snow from its sidewalks. Now the school is building a 1-megawatt, moderate-temperature electrical plant that will produce a significant portion of the Klamath Falls campus’s power needs.

In addition to the \$8.5 million 1-MW project, the campus is adding a

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# Equipment Loan tools star in 'The Great Refrigerator Robbery'

Working in Western's Energy Services is a constant education—every day we learn about new technologies and ideas utilities can use to manage their energy resources more effectively. Getting the information to our customers is a non-stop job, too. It may involve a one-on-one meeting with a power provider or answering a question through our Energy Experts Hotline or writing a story about a utility's innovative program. In the case of "The Great Refrigerator Robbery," we become part of the story.

"We" refers here to Western's Corporate Energy Services team: Manager Ron Horstman, Equipment Loan Manager Gary Hoffmann and me, Kevon Storie, Energy Services Bulletin editor and marketing coordinator. Call us the True Believers—in energy efficiency, conservation, planning and, above all, education. We love our work and never tire of sharing what we learn with Western customers (and anyone else who will listen).

Because sharing is our business—and passion—Energy Services has sponsored several Utility Exchanges, including the 2009 Colorado Utility Efficiency Exchange (CUE). A new event to the CUE this year was a poster session held during the Wednesday night reception.

## The opportunity

A poster session is a little like turning PowerPoint slides from a short presentation into one display. Attendees stroll through the session (often with a snack and beverage in hand), study the posters and ask presenters questions. It is a relaxed, informal way to show off a case study or pet program, and an excellent

fit for the utility exchange format.

The event was also a great chance to remind Colorado customers about all the handy tools they can borrow from the Equipment Loan Program. The popular program has been adding new, user-friendly diagnostic equipment to help customers keep up with consumers' growing interest in home and business energy audits. "If you want to be popular in a roomful of member services representatives and engineers, just demonstrate a piece of diagnostic equipment," said Gary.

But we really wanted to show the tools in action, so "The Great Refrigerator Robbery" was hatched.

There's a good reason why utilities like Los Angeles Department of Water and Power and Sacramento Municipal Utility District sponsor refrigerator exchange programs. Appliances account for about 17 percent of household energy use, and refrigerators are among the top three users (with high-definition TVs gaining fast). According to a story in American Public Power Association's October Public Power magazine, getting rid of these silent Energy Hogs offers utilities a "triple bang for the buck." But first you have to convince customers that their refrigerators are stealing them blind.

## The suspects

To that end, the True Believers volunteered our own refrigerators as



Equipment Loan Manager Gary Hoffmann shows off the poster that represented Energy Services at the Colorado Utility Efficiency Exchange in October.

"suspects" for the poster caper. Our jobs have made us very aware of our energy use at home, but like most people, our appliances, houses, and occasionally, our habits fall short. Wouldn't it be fun to learn more about our home energy consumption and find out if some of the Equipment Loan tools are as easy to use as advertised? Well, maybe...

The lineup included:

- Ron's 2002, 21-cubic foot, top-mounted freezer, internal icemaker
- My 1999, 22-cubic-foot, top freezer, internal icemaker
- Gary's 1980, 24-cubic-foot, side-by-side, in-door icemaker

According to Energy Star, 16 to 20 cubic feet is the most energy-efficient size, and top-mounted freezers use 10 to 25 percent less energy than bottom-mount or side-by-side models. Also, in-door icemakers are real energy vampires, noted Ron. "The chilled air inside escapes through the icemaker,

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## Great Refrigerator Robbery *from page 5*

causing the refrigerator to cycle on more often to maintain its temperature,” he explained. “If you have kids who get in and out of the freezer often to get ice, then it might save a little energy.” Clearly, the man has done his research.

Speaking of kids, none of us have any at home. Our households all have one to three adults, so we use our respective refrigerators in similar ways. Also, our “investigation” does not target any particular brand, but looks at how features, size and especially age affect appliance performance. Most utility recycling programs aim to remove refrigerators of early ‘90s vintage or older from service.

### The investigation

On a Friday night, we each took home a Watt’s Up power meter Gary had pre-programmed to simplify things...mostly for me; I am a writer, not an engineer! However, I looked at the accompanying manual and was able to mostly understand it. Around 5 p.m., everyone plugged the meters into the wall and plugged their refrigerators into the meters to collect energy-use data for the entire weekend. The game was afoot!

We used a FLIR T360 infrared (IR) camera to snap a few pictures of the suspect. The FLIR T360 can be set to simultaneously take digital pictures while the user is taking IR shots, a convenient feature for reports. The viewfinder displays the temperature range within the picture, too. What Gary saw when he pointed the camera at his old appliance was alarming. “The heating strip in the door, which prevents condensation and door freeze-up, was 25 degrees hotter than

the coolest part of the picture,” he recalled. “The temperature ranged from 62 degrees to 87 degrees.”

My photo showed a range of only 67 to 77 degrees, and in Ron’s, it was 52 to 59 degrees. The suspects’ MO was taking shape.

Curious to know more, Gary took a picture of the wall against the back of his refrigerator from the other side, in his living room. “It was very warm,” he said. Much of the energy the refrigerator was using was being given off in the form of heat. “The best I can say about it is that it will save on heating my living room this winter,” Gary joked.

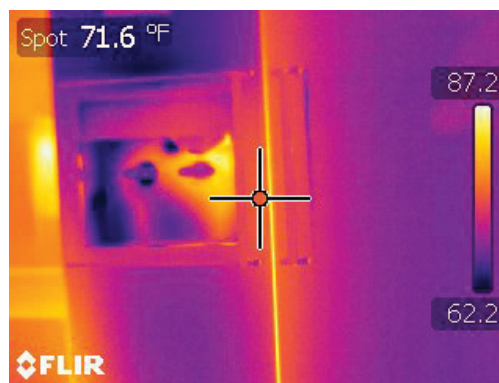
As Ron predicted, the IR picture shows cold air pouring from Gary’s in-door icemaker. My refrigerator fared better, but both top and bottom doors appear much colder than the surroundings, suggesting that they are not well-insulated. Ron’s picture shows a uniform color with only a ridge of cold showing between the freezer and refrigerator doors, and the heat strip appearing as warm.

### The verdict

The data downloaded from the power meters painted an even more detailed picture. The software for producing graphs of the data comes with Watt’s Up and is compatible with most personal computers. Users can print out graphs showing 18 different data sets, such as watt use, monthly average kilowatt-hour (kWh) use and monthly average cost. We chose the watt use graph to show the refrigerators’ day-to-day performance, and



Digital photo of Gary Hoffmann’s refrigerator.



Infrared photo of the same refrigerator. The dark and light spots show where the refrigerator may be wasting energy and running up electric bills.

included monthly kWh use and cost in the poster copy.

Ron’s refrigerator was the upright citizen of the group with consistent, well-spaced on/off cycling which spiked around 180 watts, and three defrost cycles that spiked around 400. It uses an average 33.48 kWh monthly for a cost of about \$3.68 on his electric bill. “Not quite as efficient as the manufacturer promises,” Ron admitted. “Buyers need to keep in mind that makers’ efficiency figures come from lab tests. Real world performance rarely matches up.”

My refrigerator was released on

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# Ask the Energy Experts: Desuperheaters can improve heat pump efficiency

*Notice something different? Power Line has changed its name to Western's Energy Experts!*

## Question:

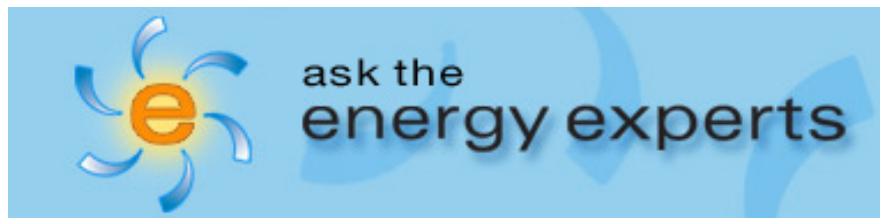
Can you provide information on heat pump desuperheaters—specifically product and research information about the technology and its application to residential buildings?

## Answer:

Let's start with a little background on how heat pumps work. The refrigerant cycle consists of compression of cold refrigerant gas (raising its temperature), cooling and condensing the hot gas to a warm liquid, and expanding the high-pressure warm liquid to a low-pressure gas. A heat pump can reverse the functions of the condenser and evaporator so it can be used to absorb heat from the outdoors to heat the house, or absorb heat from indoors to cool it.

## Capture more energy

A desuperheater is a refrigerant-to-water heat exchanger that is located near the compressor discharge, before the condenser. When the refrigerant is compressed, its temperature rises above the saturation temperature for the refrigerant at its discharge pressure—in other words, it is superheated (the energy comes from the heat of compression). Removing the super-heat does two things—it improves the efficiency of the heat pump slightly by extracting the highest-temperature energy from the cycle, and it makes this heat available



**Editor's note: The Energy Services Bulletin features real answers to real questions posed to our staff at the Energy Experts Hotline. We hope you find it useful.**

for other purposes such as water heating (which requires a relatively high temperature of 120 degrees Fahrenheit).

Desuperheaters are most often used on heat pumps in the cooling mode when there is lots of waste heat available. They improve the efficiency of the air conditioner slightly, making this technology useful in warmer climates like the southern United States.

In the heating mode, desuperheaters draw heat from the heat supplied to the house, which reduces the system heating capacity slightly. Most residential desuperheaters deliver only 3,000 to 5,000 British Thermal Units (BTU) per hour, so the reduction in capacity for a three-ton heat pump is minor, except in the coldest weather.

Running a desuperheater in heating mode still provides water heating at the coefficient of performance (COP) of the heat pump—in other words, even though it reduces the output, it is giving you two to three units of heating at the cost of one unit of electricity. Depending on your local climate, it can still be worthwhile to use a desuperheater year-round.

## Learn more

Heat Pump Desuperheaters for Supplying Domestic Hot Water—Estimation of Energy Savings and Economic Viability for Residential Applications (1.3MB .pdf) is a 1983 report from the Oak Ridge National Laboratory that provides an excellent technical overview and economic assessment of desuperheaters.

Alabama Power's Web page on water heating systems discusses desuperheaters. While it is aimed at commercial applications, it is also relevant to residential applications.

Nearly every manufacturer of heat pumps offers a desuperheater on one or more models. Energy Experts does not provide product information on the many brands available to consumers. However, a quick Web search on heat pump manufacturers will connect you with the information on specific makes and models. ⚡

**Want to know more?**  
Visit [www.wapa.gov/es/pubs/esb/2009/nov/nov094.htm](http://www.wapa.gov/es/pubs/esb/2009/nov/nov094.htm)

## Great Refrigerator Robbery *from page 6*

good behavior for using only 46.61 kWh per month at a cost of \$5.13. The four defrost cycles spiked around 420 watts, and the on/off cycles topped out at about 160. Ron noted, however, that the refrigerator cycled on and off a lot. "It might need more Freon, or the thermostat could be malfunctioning. Have it checked, and its performance might improve," he advised.

Gary's refrigerator was every inch the hardened criminal the IR pictures suggested. It ran almost constantly, and defrosted three times more often

than Ron's, often spiking over 750 watts. Gary is spending \$25.07 each month to feed his ravenous refrigerator more than 227 kWh! The Watt's Up software calculated that replacing it with an Energy Star model will repay Gary's investment in less than three years.

### Epilogue

The seasoned energy professionals at the CUE Exchange pronounced the Great Refrigerator Robbery a success. The data-gathering capabilities of the Watt's Up particularly impressed them.

Gary took the poster to the Delta-Montrose Energy Fair the following weekend where even school children

understood the message. "They were actually surprised that you could save so much money from replacing a refrigerator," he recalled.

Better yet, a new employee from San Miguel Power Association took a great interest in the auditing tools. Looks like Gary can expect some loan requests from this caper, though he added, "The Watt's Up is so versatile and inexpensive; once utilities borrow one from Western, they often decide to buy their own for energy audits and demonstrations."

And for catching Energy Hogs red-handed. Our work is finished—for now. I'm off to call a refrigerator repairman. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2009/nov/nov093.htm](http://www.wapa.gov/es/pubs/esb/2009/nov/nov093.htm)

## Report *from page 4*

second, low-temperature powerplant that can run on existing wells on the campus; two large, heated aquaculture ponds and a pair of greenhouses. These facilities are intended to be incubators for researchers and companies bringing industry to Klamath County. Eventually, the geothermal system could become part of the Sustainable Technology Park at OIT, where students will get hands-on experience with solar, wind and biofuels.

The powerplant will cut \$500,000 from the school's electric bills, not counting the excess electricity that could be sold to a commercial power

company. The school already saves about \$1 million annually in heating costs, and plans to make about \$200,000 by selling geothermal heat.

### Taking the first step

Boyd noted that combining other uses with electrical generation often improves the economics of a project. But first, a community has to learn about its resources and decide what kind of development would be appropriate. "The report is really just the beginning, but it is an easy step to take," she said.

Utilities, economic development offices and city councils can order CDs containing the information that went into the report from the Geo-Heat Center store. The cost is

\$12 for a single state's database, and \$27.50 for all 16 states.

The database lists towns by county; gives resource temperature, depth and flow; the number of springs and existing wells and the potential uses. "It's very user-friendly, and we welcome feedback we can put into the next update," Boyd said. "The report will continue to evolve."

She added that most communities in the database are aware that the resources exist, having already experienced some geothermal development. "If they haven't pursued development, the report may show them that it is time to give geothermal energy another look." ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2009/nov/nov092.htm](http://www.wapa.gov/es/pubs/esb/2009/nov/nov092.htm)